

(RESEARCH ARTICLE)



Household waste management practices from the COGEDA / DST era at SGDS in Cotonou (Republic of Benin)

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Abstract

The problem of household waste management is acute in Cotonou. From the era of COGEDA / DST to SGDS, the unsanitary conditions of household living and neighborhoods are still noticeable. This work aims to describe the household waste management practices in Cotonou from the era of COGEDA / DST to SGDS. The method adopted consisted of conducting questionnaire surveys administered to households in the study area as well as interviews with institutional stakeholders in the management of DMS in Cotonou. At the end of the field work, it was noticed that in the era of COGEDA / DST 34% of households have trash cans, and only 16 % have their garbage removed by the NGOs / SMEs pre-collection of the DSM, against 78 % in the era of SGDS. Regarding the management of wastewater and excreta, nearly half of the households in Cotonou (45%) discharge their domestic wastewater in the courtyard of houses. On-site sanitation is the main mode of excreta collection, with ventilated pit latrines representing the largest percentage (56%). 93% of respondents believe that there is no policy for public sanitation. Hence the notorious insalubrity in certain districts of Cotonou subject to increasing environmental and health risks.

Keywords: Cotonou; Household waste; Wastewater and excreta; COGEDA / DST-SGDS

1. Introduction

Urbanization and the development of economic activities have as a corollary an increase in the consumption of goods and services and in the production of waste. The regulations on waste management exist in all the countries of the sub-region but their application comes up against a variety of constraints and physical and / or human realities [1]. The deterioration of the quality of life due to the accumulation of solid household waste on both sides in the cities over the last decade and its impact on the health of populations is also an environmental problem for Benin [2]. In Cotonou, the annual production of waste, which was 180,617 tonnes in 2012, was around 238,962 tonnes in 2018 [3] Thus the COGEDA (Coordination of NGOs for the Management of Household Solid Waste and Sanitation in Cotonou) and the DST (Department of Technical Services) of the town hall of Cotonou were confronted with difficulties in managing DSMs leading to the establishment of SGDS (Waste and Sanitation Management Company). However, a variety of practices are still developing in households and in the long term constitute threats not only for the sustainability of the current waste management system but also for the environment and the health of populations. This state of affairs deserves investigation in order to zoom in on current household waste management practices in Cotonou. The present study aims to describe these practices on the management of household garbage, domestic wastewater and excreta.

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2. Material framework and study methods

2.1 Study framework

The city of Cotonou is located on the coastal strip from which it takes its name from the Littoral department, resulting from the last administrative division of Benin on January 15, 1999. It is located between 6° 20' and 6° 23' north latitude and 2° 22' and 2° 30' east longitude. It represents the only Municipality of the Littoral Department and is limited to the North by the Municipality of Sô-Ava and Lake Nokoué, to the South by the Atlantic Ocean, to the East by the municipality of Sèmè-Kpodji and to the West by that of Abomey-Calavi (figure 1). It covers an area of 79 km² (0.07% of the national territory), 70% of which is located to the west of the channel (Monograph of the Municipality of Cotonou, 2006: P.9). It is the only department in the country with a single municipality, with 13 districts and 143 city districts. Cotonou is the economic capital of Benin and alone concentrates almost all the administrative and political functions of the country. The city of Cotonou benefits from important infrastructures and several socio-economic activities are developed there. It has a road network which includes a fairly dense road network which has more than 600 km of tracks and a currently not very functional rail network.

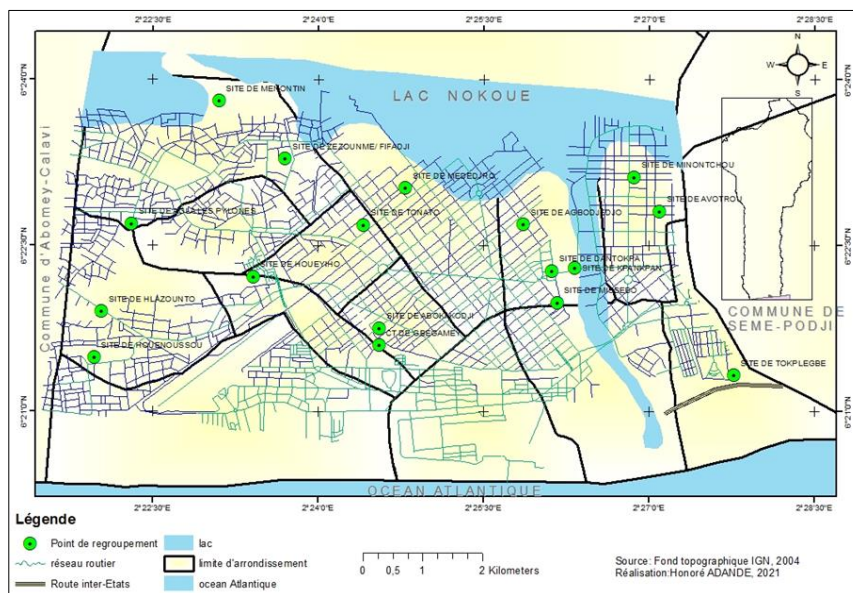


Figure 1 Geographical location of the city of Cotonou

The city of Cotonou does not have a watercourse, but Lake Nokoué (85 km²) and some swamps constitute the city's water reservoirs. During the flood due to the descent of water from the north and especially the great rainy season, the city is threatened by serious flooding (low level, strongly influenced by variations in the level of water bodies; maximum flood level: 1, 50 meters). The geographical location of the city of Cotonou, which does not have a large area, is a constraint in the management of household waste, where the swamps and the banks of Lake Nokoué constitute the places of waste dumps for the populations and certain waste pre-collection structures. solid household.

2.2 Study materials and methods

2.2.1 Type of study

This is a descriptive and cross-sectional and retrospective study that took place from March 2019 to July 2021. It aims to describe the modes of household waste management in the city of Cotonou in Benin.

2.2.2 Study populations

In the context of this study, the targets are made up of all the players in the household waste sector. These are households, the political and administrative authorities are considered to be involved in the management of heavy waste.

2.2.3 *Study data*

The data collected within the framework of this research are those relating to the types of household waste produced by households, and the quantity of household waste produced, the methods of household waste management from the COGEDA / DST era to the era of SGDS.

2.2.4 *Data collection techniques and tools*

The research was carried out along the following three axes: documentary research, interview survey and direct observation.

Documentary research

It concerns research which has made it possible to compile information available in reports and studies on waste management in general and household waste in particular. Articles and comments posted on the Internet are also among the main sources of documentation used, as are DEA and thesis papers on the subject. This research made it possible to synthesize knowledge on the subject. Documents on waste management in Cotonou such as, legislative and regulatory texts relating to hygiene and sanitation, and environmental protection were also consulted nationally and internationally.

Field work

Regarding field surveys. They took place in two phases

The first phase to take stock of household waste management in Cotonou in the COGEDA / SGDS era was carried out in March 2019. The surveys concerned 754 households in the 13 districts of the city of Cotonou. All players in the household waste management sector have been affected. These are households, the NGOs of the time which took care of the pre-collection of household waste, local elected officials, officials from the Cotonou town hall and the technical and financial partners who intervene in the management of waste from households. household.

The second phase took place in July 2021, one year after the establishment of the SGDS, which deals with the management of household waste in Grand Nokoué, of which the city of Cotonou is a part. This phase also covers the management of household waste and the state of sanitation of the city of Cotonou. As in the first phase, 754 households were surveyed on their waste management methods after the implementation of new reforms on household waste management in Grand Nokoué. In addition to households, the SMEs which take care of the pre-collection of waste and sanitation in the city of Cotonou as well as the managers of the SGDS were interviewed on the methods of household waste management in the city from Cotonou.

Direct observation

According to Massonat (1987), "direct observation is a process of knowledge serving multiple purposes which is part of a global human project to describe and understand his environment and the events that take place there." . This method was used to collect qualitative data in addition to the interviews. The aim is to collect data on the basis of observations made in the field regarding the methods of household waste management. direct field observations made it possible to assess the effectiveness of each of the two household waste management systems in the city of Cotonou.

2.2.5 *Data processing and analysis of results*

The processing of the data and the analysis of the results constitute the last part of the methodological approach used in this study.

After the data was collected, they were entered in the Excel 2013 spreadsheet. The data was processed under SPSS for the calculation of averages, frequencies and the production of a few graphs. The environmental quality indicator was calculated to assess the effectiveness of the household waste management system put in place by SGDS. It is a composite indicator that was calculated from certain parameters of waste management and sanitation of the living environment of households.

3. Results

3.1 Household waste management practices from the COGEDA / DST era to the SGDS

From the era of COGEDA / DST to SGDS, the way DSMs were stored has not changed. Surveys carried out among households in the city of Cotonou revealed that 34% of households have garbage cans, 11% do not store their garbage and 55% use uncovered receptacles to store their garbage (figure 2).

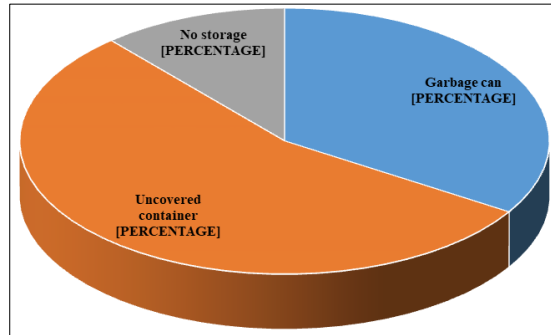


Figure 2 Main method of garbage storage in households in Cotonou; (Source: ADANDE fieldwork, 2019)

In the era of COGEDA / DST, there are several modes of evacuation of DSMs in Cotonou. Fieldwork shows that 16% of households have their garbage removed by pre-collection NGOs, 26% bury their garbage, 18% throw it in illegal dumps, 11% practice incineration, 8% throw their garbage in the swamps, 5% in a garbage bin or at the collection point, as shown in fig 1. This multiplicity of waste disposal methods does not comply with ecological standards in household solid waste management.

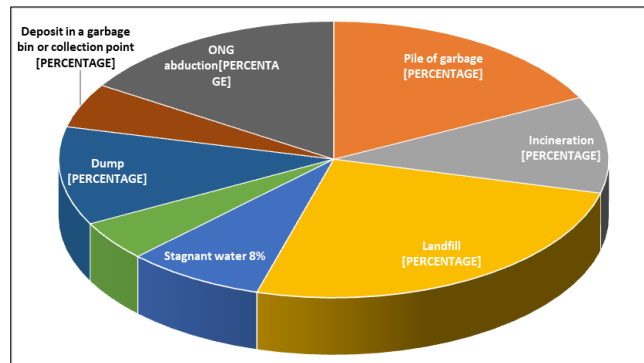


Figure 3 Waste disposal method in households in Cotonou in the era of COGEDA / DST; (Source: ADANDE fieldwork, 2019)



Shooting: Adande, Fieldwork March 2019.

Figure 4 Open gutter filled with garbage at HLAHOMEY in the 3rd Arrondissement of Cotonou in the era of COGEDA / DST

In any case, most household waste ends up in the streets and in open gutters as shown in figure 4.

Despite the periodic cleaning operations carried out by the authorities responsible for sanitation in the area, the water collectors, especially open-air, are DSM reservoirs in several districts in Cotonou, as shown in figure 4.

With the advent of the SGDS, the mode of evacuation of the DSMs completely changed from the mode existing in the era of COGEDA / DST. The investigations carried out among households in the city of Cotonou give the results shown in Figure 5.

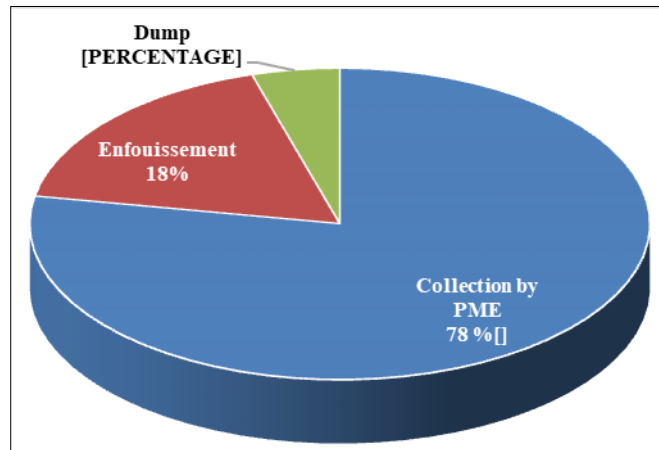


Figure 5 Waste disposal method in households in Cotonou during the SGDS era; (Source: ADANDE fieldwork, 2021)

Figure 4 reveals that 78% of households in Cotonou have their garbage removed by NGOs that have become SMEs. This is justified by the provisional free admission of the DSM pre-collection in force since 2020 in Grand Nokoué. In addition, 18% of households surveyed continue to bury rubbish and 4% use illegal dumps.

3.2 Methods of domestic wastewater management from the COGEDA / DST era to the SGDS

Household investigations revealed the production of several categories of domestic wastewater in Cotonou, the most important of which are: dishwater, cooking water, washing water and bath water. Most households discharge their wastewater into the yard and onto the street or into storm drains. (Figure 6).

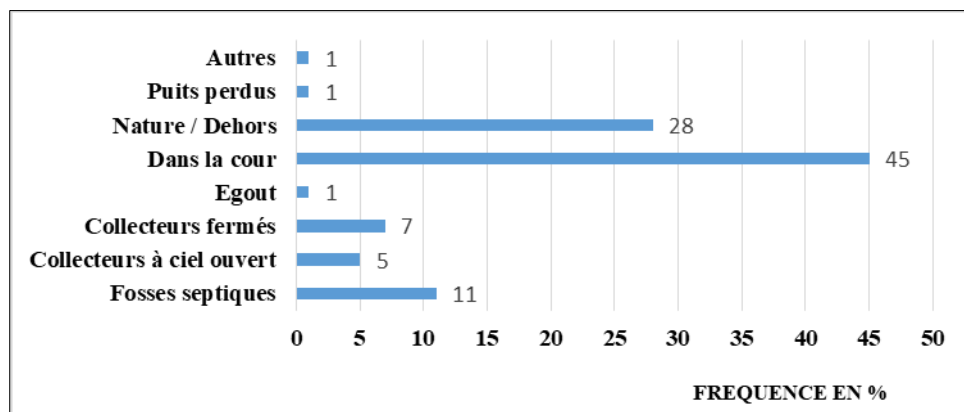


Figure 6 Methods of evacuation of domestic wastewater in Cotonou; (Source: Fieldwork 2021)

As shown in Figure 5, nearly half of Cotonou households (45 %) discharge their wastewater in their courtyards. 28 % prefer to dump them outside. Only (11 %) dump them in their septic tanks. It is noted that some households rely on rainwater collectors to evacuate their wastewater.

3.3 Excreta management practices from the COGEDA / DST era to the SGDS

From the era of COGEDA / DST to SGDS, the types of latrines in households have not changed. Surveys carried out among households in the city of Cotonou revealed that more than half of households (56 %) have ventilated pit latrines, 34 % use unventilated pit latrines. Only 10 % use flush latrines (Figure 7).

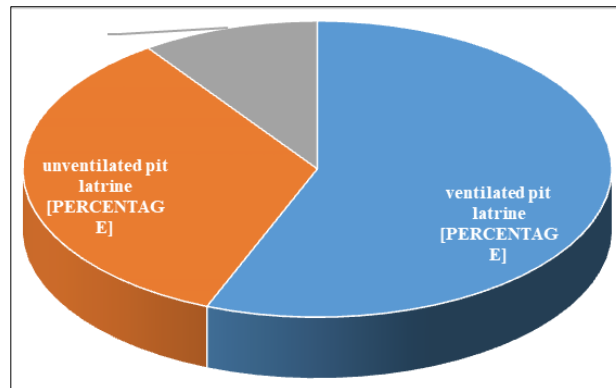


Figure 7 Typology of latrines in households in Cotonou; (Source: Fieldwork)

In Cotonou, households are used to making themselves comfortable in several ways. Surveys carried out among them have shown that half of households (48 %) use septic tank toilets and 52 % either use public latrines (30 %) or dumps (12 %). and in nature (10 %) (Figure 8). This method of excreta management contributes to unsanitary conditions in households. During the investigations, a few managers of pre-collection SMEs for DSMs reported the presence of excreta which is sometimes mixed with garbage in the bins. This seriously upsets the garbage collectors during pre-collection operations.

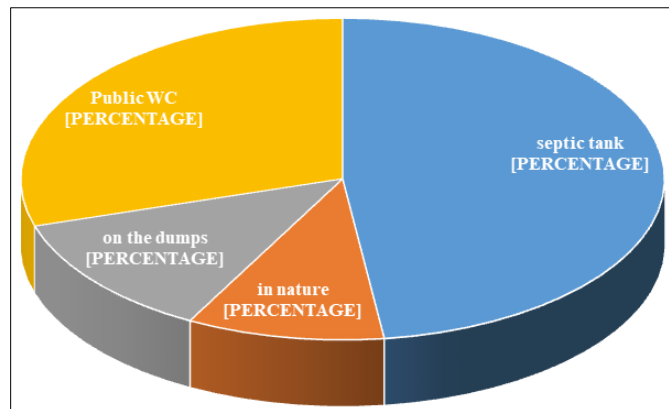


Figure 8 Usual places of ease of households in Cotonou; (Source: Fieldwork)

Similar results were obtained by INSAE (2013). It should be noted that there are households without a toilet in the area (10 %). These households therefore make their living either in nature or through other unknown modes.

3.4 Difficulties of the household waste management system in the era of COGEDA / DST

During the COGEDA / DST era, the DSM management system encountered difficulties relating to all the links in the DSM management process: pre-collection, collection / transport and processing of DSM.

3.4.1 Difficulties related to DSM pre-collection activities

They are numerous and are summarized around the following axes:

- Insufficient workforce (Carters);
- insufficient rolling stock (trucks and tricycles);
- updating of the zoning in Cotonou,

- diversification of pricing;
- difficult access to the tracks leading to the regrouping points;
- late payment of bills by households;
- incivism of local populations in the anarchic use of regrouping points.

3.4.2 Major difficulties related to DSM collection activities

At the time of COGEDA / DST, the difficulties associated with collection activities in Cotonou are numerous and are as follows:

- Poor maintenance of dumps;
- insufficient rolling stock (trucks)
- insufficient containers;
- impassability of certain roads leading to regrouping points in the rainy season;
- The inadequacy of the infrastructure of the Collection Points compared to the collection equipment;
- Garbage traffic at inappropriate times.

3.4.3 Difficulties related to the treatment of Household waste

- Lack of formal sorting in the regrouping points;
- Accessibility: About 5 km long, the access road to the site, after 35 km of motorable road, is an impassable dirt track closed to traffic after the heavy rains. This closure can last several days, thus preventing carriers from emptying the containers and carters from lifting the bins. The pre-collection transfer chain is broken and creates a great inconvenience to the population.

3.4.4 State of sanitation of the city of Cotonou in the era of COGEDA / DST

During the COGEDA / DST era, in Cotonou, the city was unsanitary, accompanied by a stench near the water collectors and uncontrolled dumps of DSM. During fieldwork, foul odors were released in some poorly maintained environments. In these areas, it is almost impossible to breathe well because of the odors that these collectors give off all the time. While it is true that periodic cleaning of these collectors is carried out by the formal actors in charge of environmental sanitation, it should also be noted that these actions are not sustainable because a few days are enough to see the same damage again..

The accumulation of DSM in the alleys of urban areas, the burial of waste and the presence of unauthorized DSM dumps are likely to generate contamination of well water. Indeed, the decomposition of certain materials under the effect of heat, sunshine and rains results in leachate which can seep into the shallow water table in Cotonou. This state of affairs can lead to several water-borne pathologies. This is the case, for example, of an uncontrolled landfill in the middle of the KPANKPAN agglomeration in the 3rd Arrondissement of Cotonou (figure 9).



Figure 9 Unauthorized deposit in built-up areas at KPANKPAN in the 3rd Arrondissement of Cotonou; (Shooting: Adande, March 2019)

This wild dump is located in the heart of an undeveloped water channel. It then constitutes nests of mosquito larvae, parasitic and a source of microbial pollution of the water of the surrounding wells by infiltration of the leachate into the shallow water table of the city of Cotonou.

3.4.5 State of sanitation in the city of Cotonou in the SGDS era

In the era of SGDS, even if an improvement in the management of DSMs is remarkable thanks to the deployment of the new Company in charge of sanitation in Cotonou, the problem of unhealthiness still remains. Direct observations in certain neighborhoods have made it possible to observe several types of environmental nuisance linked to poor waste management.

The rejection of DSMs on public spaces makes the environment unhealthy and disrupts the beauty of the city. This is the case with the old Dantokpa bus station transformed into an uncontrolled dumping ground. Even if the health officers come to clean up this place from time to time, the days of their absence the environment is littered with DSM. This degrades the urban environment because the bus station had already undergone the operation to free up public space initiated by the Prefect of the Coastline in 2017 and since then the administrative authorities have not been able to develop this space in the heart of Cotonou in the 6th Arrondissement.



Figure 10 Wild dumping of DSM on the old DANTOKPA road park in the 6th Arrondissement of Cotonou; (Shooting: Adande, January 2021)

At the start of the implementation of household waste management reforms in Grand Nokoué, the SGDS proceeded with the destruction of illegal dumps in the city of Cotonou in order to clean up the living environment of the populations. To this end, several DSM regrouping points have been set up in the city. Consolidation points have been installed in the districts, unlike the days of waste management by COGEDA / DST when some districts of the city did not have a waste collection point at all. Despite these measures, wild dumps are being reconstituted in places in the city, especially in outlying areas. This is the case, for example, with a wild dump that has been destroyed and which is gradually rebuilding, as shown in figure 11 in Avotru in the 1st Arrondissement of Cotonou.



Figure 11 Recolonization of a wild dump site in Avotru in the 1st Arrondissement of Cotonou; (Shooting: Adande, August 2021)

The direct observations on the ground made it possible to notice the stagnation in places of water in some water collectors. This is often caused by the uncontrolled discharges of household wastewater and especially DSM blown away or even clumsily deposited by residents of these gutters either near or in the collectors. The stay of these DSMs, whose chemical composition is toxic, is a source of pollution of the water in the gutters which are ultimately drained into the

channel and constitutes a risk of contamination of the water in the channel and by ricochet that underground. Figure 12 illustrates the observation made in the study environment.



Shooting: Adande, Fieldwork March 2021

Figure 12 Stagnation of water strewn with DSM in a water collector near the channel at HLACOMEY in the 3rd Arrondissement of Cotonou

Evaluation of the efficiency of the management of household waste and sanitation in the city of Cotonou by the SGDS

The effectiveness of the reforms initiated by the State in the healthiness of the living environment of households was assessed as part of this study by a composite indicator of environmental health. Table I shows the results from the calculation of the environmental quality indicator.

Table 1 Environmental Quality Indicator (IQE)

		Workforce	Percentage	Percentage valide	Cumulative percentage
Valide	Very unsanitary	105	17.5	17.5	17.5
	unsanitary	290	48.3	48.3	65.8
	Healthy	149	24.8	24.8	907
	Very healthy	56	9.3	9.3	100.0
	Total	600	100,0	100,0	

Reading Table 1, it turns out that: 17.5% of households in the study environment live in a very unhealthy environment, 48.3% live in an unhealthy environment, and only 24.8% and 9, 3% of households live respectively in a healthy and very dirty environment.

4. Discussion

The present has evaluated the mode of solid household waste management in the city of Cotonou from the era of COGEDA / DST to the era of SGDS. It appears from this study that the management of household solid waste has seen a lot of improvement since the implementation of the new reforms. Most of the waste produced by households in the city of Cotonou is pre-collected by the SMEs recruited for this purpose. This improvement in waste pre-collection is due to the free pre-collection operation in Grand Nokoué. Despite this observed improvement, part of the population of the city of Cotonou continues to dump their waste on open spaces and especially in the swamps and the banks of Lake Nokoué. The majority of the populations settled in the swamps or on the shore of Lake Nokoué use solid household waste as backfill to fill the spaces occupied by surface water. However, the management of DSMs in Cotonou has improved compared to previous years where according to INSAE (2013) [4], 59.7% of households subscribed to pre-collection NGOs, 33% rejected their waste in nature, 0, 7% did incineration and 0.4% landfill; Public roads (2.7%).

Regarding the management of wastewater and excreta, the management methods have not changed. 56% of households have ventilated pit latrines, 34% use unventilated pit latrines. Only 10 % use flush latrines. These results are similar to those of INSAE (2013) where 57% of households discharge their wastewater into nature, 20.6% in septic tanks, 9.6 % in the yard 10.7% in the gutters. Only 0.4 % use soak and other wells (0.8%). These results show a reversal of the tendency of households to discharge their wastewater in preponderance in the courtyards of houses compared to discharge into nature. These practices in no way guarantee the preservation of the health of the environment and, by extension, the state of health of the populations. Because the infiltration of this wastewater potentially laden with microbial particles is likely to contaminate water resources.

The environmental health indicator calculated as part of this study to assess the efficiency of the household waste management and sanitation system in the city of Cotonou showed that 17.5 % of households in the middle of The study live in a very unsanitary environment, 48.3% live in an unsanitary environment, and only 24.8% and 9.3% of households live in a healthy and very dirty environment, respectively. These results are not far from those of Hounkponou (2020) who find that 29.46% of households live in a healthy environment in the city of Cotonou, 27.68% of households are in an unhealthy environment. Biao et al., (2019) [5] found similar values of the rate of households living in a very unhealthy and unhealthy environment in the city of Cotonou. So despite the efforts of the central government to improve the management of household waste in the city of Cotonou, the state of healthiness of the living environment has not changed.

5. Conclusion

Urbanization and the development of economic activities have as a corollary an increase in the consumption of goods and services and the production of waste in the city of Cotonou. The annual production of waste is 238,962 tonnes in Cotonou. The management of household waste in the city of Cotonou is subject to many failures. Households use several modes to manage waste: landfill, dumping waste on empty spaces and banks, incineration are the causes of the proliferation of dumps in the study environment. Several factors determine the subscription of households to pre-collection structures in the city of Cotonou. These are the profession of household heads, household income, the nature of construction equipment. These management methods adopted by households in the study environment contribute to the growing insalubrity observed in the city.

Compliance with ethical standards

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Disclosure of conflict of interest

The writing of this manuscript is without conflict of interest. Each of the authors contributed to the success of this manuscript.

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